
# Stellar Wobble by a Planet and a Circumstellar Disk

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Astrometric detection of a stellar wobble on the plane of the sky will provide us a next breakthrough in searching for extrasolar planets. The Space Interferometry Mission (SIM) is expected to achieve a high-precision astrometry as accurate as 1 microarcsecond, which is precise enough to discover a new-born Jupiter-mass planet around a pre-main-sequence (PMS) star in the Taurus-Auriga star forming region. PMS stars, however, have circumstellar disks that may be obstacles to the precise measurement of the stellar position. We present results on disk influences on the stellar wobble. The density waves excited by a planet move both the disk's mass center and the light center. The motion of the disk mass center induces an additional wobble of the stellar position, and the motion of the disk light center causes a contamination in the measurement of the stellar position. We show that the additional stellar motion dynamically caused by the disk's gravity is always negligible, but that the contamination of the disk light can interfere with the precise measurement of the stellar position. The effect of the disk's light is significant if the planet's mass is smaller than $10M_{Jupiter}$. The motion of the disk light center is sensitive to a slight change in the wave pattern and the disk properties. Measurements by interferometers are generally insensitive to extended sources such as disks. Contamination of the disk light is greatly reduced when observed by SIM.